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ABSTRACT

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Technical Report No. 105

BEYOND LITERAL SIMILARITY

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Abstract

Hitherto, theories of similarity have restricted themselves to judgments of what might be called literal similarity. A central thesis of this paper is that a complete account of similarity needs also to be sensitive to nonliteralness, or metaphoricity, an aspect of similarity statements that is most evident in similes, but that actually underlies metaphorical language in general.

Theoretical arguments are advanced in support of the claim that metaphoricity can be represented in terms of the relative degrees of salience of matching (or matchable) attributes of the two terms in a comparison. A modification of Tversky's (1977) account of similarity is proposed. The implications of this proposal for similarity statements are discussed, along with implications for the psychological processes involved in their comprehension.

It is argued that the general account of similarity proposed, including, as it does, nonliteral similarity, can not only form the basis of a theory of metaphor, but can also give a credible account of the relationship between metaphor, analogy, and similarity.

Beyond Literal Similarity

Most theoretical approaches to similarity have been based on geometric models, namely models in which the similarity between two objects is a decreasing monotonic function of the distance between their representations in a multidimensional space. One problem with such approaches is the difficulty that they have in readily accounting for the lack of symmetry that is often found in similarity judgments, since geometric models are constrained by the fact that the distance between two points in a Euclidean space is the same regardless of the direction in which it is measured[1]. Partly in response to this problem, Tversky (1977) proposed a contrast model based on feature matching, which does seem able to deal with the asymmetry problem. But neither Tversky's model as it stands, nor the spatial models that he criticized, are able to deal well with the radical asymmetry that is the hallmark of what might be called nonliteral similarity statements. The most obvious examples of such statements are similes, but nonliteral similarity seems to underlie many kinds of figurative uses of language, and in particular, it seems to constitute the basis of metaphors. Since it is widely believed that metaphorical language and metaphorical thought are based on statements and judgements of similarity (see Ortony, Reynolds, & Arter, 1978, for a review), there is a need for a theory of similarity that is sufficiently powerful to deal with nonliteral comparisons. The main purpose of this paper is to offer some proposals that might lead to a comprehensive theory of similarity sufficiently powerful to constitute the

basis of a theory of metaphor, in other words, a theory of similarity that goes beyond literal similarity, to nonliteral similarity. Such a theory would also be tantamount to a theory of metaphoricity, since it would tell us what it is about a metaphor that makes it metaphorical. What is presented is not yet an empirically tested theory. Several investigators are currently engaged in research which promises to provide data pertinent to some of the issues raised, but it may take many years to accumulate sufficient data to resolve them. Therefore, it seems appropriate to attempt to identify the issues and to propose possible solutions to them now, in the spirit of the hypothetico-deductive method.

Two theoretical constructs constitute central presuppositions of this paper. Both are quite familiar, but it is important to lay them out so that their interpretation in the current context is clear and unambiguous. The first is that of a knowledge representation. The representations that will be presupposed here have been variously called frames (e.g. Minsky, 1975), scripts (e.g. Schank & Abelson, 1977), and schemata (e.g. Rumelhart & Ortony, 1977). Henceforth, the term schema(ta) will be employed. A crucial characteristic of schemata is that they embed; a schema may contain tokens of, and tokens of it may be contained by, other schemata. Such subschemata can be viewed as representing predicates or attributes of the schemata that they dominate, or by which they are dominated.

It is necessary that in any model dealing with the utilization of schemata in comprehension, the availability of schemata and of subschemata should be sensitive to context. It is here that the second important

concept, salience, comes into play. Several studies (e.g. Barclay, Bransford, Franks, McCarrell & Nitsch, 1974; Anderson and Ortony, 1975) have shown that context influences and determines the particular aspects of word meanings that are salient on any particular occasion. Put in terms of schema theory, this means that in any particular context some subschemata may be irrelevant, or inappropriate, and consequently will not be involved in the comprehension process. This, in turn, can be expressed by saying that the salience of constituent structures in a knowledge representation can change as a function of context. In this paper it will be assumed that salience can be operationally defined in terms of subjects' estimates of the prominence of a particular attribute with respect to a concept to which it does or could apply, although other (presumably highly correlated) measures, such a frequency and/or order of mention in an elicitation task, might do just as well.

The first main claim that will be made is that Tversky's (1977) account of similarity can be profitably modified in such a way as to provide a measure of similarity that is sensitive to metaphoricity. It will be argued that the principal source of metaphoricity is the difference in the relative salience of matching attributes of the terms in the comparison. This discussion can be found in the section on salience imbalance and metaphoricity. The next section, identifies another variable that affects metaphoricity. This variable is attribute inequality, and it arises when putative matches in fact only match metaphorically, or at higher levels of abstraction in some assumed taxonomic structure. It is particularly

noticeable when the domains from which the two terms are drawn are very disparate or, incongruent, and, it is claimed, attribute inequality enhances the metaphorical effects of salience imbalance. The third section, on metaphoricity and asymmetry, discusses a number of symmetry-related issues arising from the proposed modification to Tversky's formulation of similarity. Then, the section on two types of similarity statements attempts to show that similarity statements which are understood in terms of discovered matches of attributes have to be distinguished from those which can only be understood by introducing new attributes to the first term. Finally, in the last section, on metaphor, the implications of the proposals for a theory of metaphor are discussed.

Salience imbalance as a source of metaphoricity

The theory of similarity proposed by Tversky (1977) is designed to account for the degree of judged similarity between two objects represented by, say, the terms a and b. The theory, which is well supported by the data, is that the perceived similarity, s(a,b), is a weighted function of the intersection of attributes of a and b, less the sum of a weighted function of the attributes distinctive to one and a weighted function of the attributes distinctive to the other, giving:

$$s(a,b) = \theta f(A \cap B) - \alpha f(A - B) - \beta f(B - A) \qquad (1)$$

Here, the function f() is a measure of the salience of features or sets of features, while θ, α and β are parameters that reflect the importance of the shared and distinctive features. Thus, for example, if $\alpha = \beta = 0$, and

$\Theta = 1$, the perceived similarity depends only on the shared attributes. Accordingly, changes in the values of α, β, and Θ give rise to different similarity scales. A and B represent the sets of features of a and b respectively, while (A - B) is to be interpreted as $(A - (A \cap B))$, and (B - A) comparably. It is assumed that the salience of a set of attributes is given by the sum of the salience of each member of the set (p. 332).

Tversky argued that there are two principle factors that determine the salience of an attribute. The first, intensity, is independent of the object and "refers to factors that increase intensity or signal-to-noise ratio, such as the brightness of a light, the loudness of a tone, the saturation of a color, the frequency of an item, the clarity of a picture or the vividness of an image (p. 342)." The second factor, diagnosticity, does depend on the object, together with its relationship to other objects. Diagnosticity is concerned with the discriminability of an object from other objects with which it is implicitly or explicitly classified. It therefore presupposes a context of alternatives for the object. In the absence of such a context, or in a context where the contrast set can only be considered to be the universe of objects in general, diagnosticity presumably plays no role. Unfortunately, Tversky did not explain how intensity and diagnosticity interact, but for present purposes the important point is that a consequence of Tversky's position is that when diagnosticity does not come into play the salience of an attribute is independent of the object(s) of which it is an attribute. This means that the measure of an attribute's salience would be a constant and that it would contribute a constant amount to the overall

salience of the stimulus. Mathematically this is convenient since it means that the determination of the salience of the set of intersecting attributes in equation (1) is quite straightforward: $f(A_n)$ (the measure of attribute n in A), and $f(B_n)$ (the measure of that same attribute in B) will be the same.

The chief difference between Tversky's model and the present one is that the latter requires that the salience of an attribute depends on the particular object of which it is an attribute, as well as on other, contextual, factors. In the present model the perceived similarity between two objects depends, in part, on the relative level of salience of matching attributes, thus, in general, it cannot be assumed that $f(A_n) = f(B_n)$. Rather, it is supposed that <u>independent</u> of diagnosticity, an attribute can be more important with respect to one object than it is with respect to another, just as some members of natural categories are always more typical than others (e.g. Rips, Shoben, & Smith, 1973; Rosch, 1975). For instance, as a rule, being made of iron is a more important attribute of magnets than it is of railroad tracks; and, even though not necessary for either, being red is a more important attribute of a fire truck than it is of a brick. The issue of whether or not the salience of an attribute is independent of the object that possesses it appears to be an unsettled empirical question. Yet, it is not at all easy to test. It is difficult to distinguish between the absolute amount of salience an attribute contributes to an object, on the one hand, and such confounding variables as the relative amount it contributes, and the amount of knowledge subjects have about the objects, on the other.

The rejection of Tversky's assumption that the salience of an attribute is independent of the object raises a difficulty for determining the salience of the intersection of A and B in equation (1). How is $f(A \cap B)$ to be computed? The answer to this question constitutes one of the central claims of the present proposal. It is that the salience of the intersection of A and B is dependent on the salience values of matching elements in B, rather than on some function of the values in both A and B, or of their values in A alone. Equation (1) can now be re-written to give equation (2):

$$s(a,b) = \theta f^{B}(A \cap B) - \alpha f^{A}(A - B) - \beta f^{B}(B - A) \qquad (2)$$

where $f^{A}()$ and $f^{B}()$ represent measures of salience based on the values in A and B respectively. The measure of similarity, as given by equation (2), remains essentially the same as Tversky's (equation (1)) in cases where the matching attributes are of comparable salience in both A and B. So, when the matching attributes are of relatively low salience for both objects, those objects will not be judged very similar; when the the salience levels of matching attributes are relatively high for both, the predicted similarities will again be similar to those from equation (1). Henceforth we shall refer to similarity statements in which the matching attributes are of comparably high salience (high-B/high-A) as being <u>literal similarity statements</u>, although it should be recognized that this is a shorthand way of saying that such statements are predominantly literal, since literalness (and its complement, metaphoricity) is a matter of degree. This seems to accord with common sense. It could be taken as axiomatic that if two things

share some characteristics that are important to both then those things will be perceived as being literally similar.

However, it is now possible to go further than the mere characterization of literal similarity. Both nonliteral similarity statements and anomalous ones can be characterized. To the extent that matching attributes are of less high salience in A than they are in B, while there exist high salient attributes in B that cannot be applied to a, comparisons between the corresponding terms will be nonliteral (high-B/low-A). Such statements are usually called similes. And, to the extent that similarity statements are neither literal nor nonliteral in the sense just explained, they will be anomalous. Thus, literal and nonliteral similarity statements do not form mutually exclusive classes of statements. Nor, for that matter, do anomalous and meaningful ones. It is preferable to think in terms of three components of similarity statements, the literal, the nonliteral (or metaphorical), and the anomalous. Sometimes one or two of these components contribute virtually nothing to the perceived similarity (e.g. the anomalous component contributes nothing if a statement is perceived as being a literal similarity statement). As will be discussed in greater detail with the help of examples (4) - (8) below, the present proposal identifies two rather different sources of anomaly in similarity statements. The one arises from the assertion of similarity between two things that have a very low degree of similarity (low-B/low-A matches), and the other arises from cases in which there is, essentially, a reversed simile (low-B/high-A).

What is being claimed is that the imbalance, I(a, b), in salience levels of matching attributes of the two terms is a principal source of metaphoricity. A convenient way of conceptualizing this imbalance is to visualize the attributes of a and b as a list with the most salient attributes at the top. Then salience imbalance can be thought of as the degree of diagonality from attributes in B to attributes in A, and can be characterized, to a first approximation, by considering the combined effect of the difference in salience between the matching attributes for a and for b, together with the (independent) degree of salience in each, as in equation (3):

$$I(a,b) = g(f^{B}(X_i, \ldots X_{i+n}) - f^{A}(X_i, \ldots X_{i+n})) \qquad (3)$$

where g() is some, probably additive, function, and $\{X_i, \ldots X_{i+n}\} = (A \cap B)$. In cases where salience imbalance is the only source of metaphoricity, the degree of metaphoricity can be equated with the degree of salience imbalance, or diagonality. It then follows from equation (3) that the more literal a similarity statement is, the lower will be its degree of metaphoricity because the matching attributes have comparable (predominantly high) degrees of salience in both A and B. Furthermore, the terms in highly literal similarity statements are likely to be judged more similar than the terms in more metaphorical ones because the set of intersecting attributes is likely to be larger in the former; and, the rated similarity of nonliteral similarity statements is likely to be higher than for anomalous ones because in the case of the former the measure of salience of the set of

intersecting attributes will be greater, as determined by the term $f^B(A \cap B)$, than that measure for anomalous comparisons, where the intersecting set may often even be empty.

The present proposal, then, not only distinguishes literal from metaphorical similarity statements and provides a measure of similarity that is sensitive to both, it also characterizes two sources of anomaly in putative similarity statements. Consider the following similarity statements:

billboards are like placards (4)

billboards are like warts (5)

billboards are like pears (6)

chairs are like syllogisms (7)

sleeping pills are like sermons (8)

According to the present proposal, statement (4) is basically a literal comparison since billboards and placards share a number of high salient attributes. By contrast, statement (5) is a nonliteral comparison because, although no salient attributes are shared, there are some high salient attributes of warts that are less high salient attributes of billboards (e.g. they are ugly), while there are other high salient attributes of warts that cannot be applied to billboards at all (e.g. they are found on the skin). Thus, statement (5) is a metaphorical similarity statement, that is, a simile. The remaining cases are anomalous. In example (6) the only attributes common to both terms are trivial, low salient, attributes, such as "being a thing" or "being a physical object", and thus the measure of

similarity will be very low. What makes such a statement anomalous is that it cannot normally be expected to fulfill a communicative function. It seems to violate the Gricean maxim of quality (Grice, 1975). In example (7) the two terms seem not even to share low salient attributes and consequently it too is anomalous in essentially the same way. Finally, in statement (8), the only match seems to be of an attribute like "being soporific", that is, a high salient attribute of the a term and a low salient attribute of the b term. The anomaly here is of a different kind. There is a match alright, but both the similarity and the metaphoricity are low since the value of $f^B(A \cap B)$ depends on the (low) salience value of the attribute for the b term, sermons. One prediction that follows from this is that other things being equal, cases like statement (8) will tend to receive slightly higher similarity ratings than cases like statement (7) because the intersection term is necessarily always empty for the latter. Cases like statement (8) might also be expected to receive higher similarity ratings than cases like statement (6) because the abstract and low salient attributes that are shared (e.g. "is a thing") by the terms in cases like statement (6) are probably not directly represented in the schemata associated with the terms. By contrast, preliminary data that we have collected suggest that subjects often recognize that reversed similes, like statement (8), are indeed reversed similes. Perhaps for this reason, rated similarities for reversed similes tend to be higher than predicted by equation (2).

There is always the possibility that a reversed simile may give rise to a new simile with a totally different meaning but with comparably high

metaphoricity and similarity ratings, as, for example, is the case with statement (5) and its reversal, statement (9).

warts are like billboards (9)

Some people find that ugliness, while important in the meaning of statement (5), becomes much less important in statement (9), where attributes related to prominence seem to come more into focus. Another example of the meaning change associated with the reversal of terms in a simile is provided by statements (10) and (11).

butchers are like surgeons (10)

surgeons are like butchers (11)

Here, not only are the bases of the comparisons quite different, they are actually incompatible. The present account explains this fact quite easily; it maintains that the basis of a similarity statement depends on the salience levels of matching attributes relative to the b term, and due to salience imbalance, the basis is likely to be different as the two terms are interchanged. Notice, also, that in statements (10) and (11) there is a reversal of affective valence. Affective attributes are often (although by no means always) an important part of the basis of nonliteral similarity statements.

In spite of the peculiar behavior of reversed similes, the similarity statements that the present proposals identify as anomalous are relatively difficult to interpret; the generation of an interpretation cannot normally

be readily achieved. It is true, as with most well-formed sentences in a natural language, that an interpretation can be forced. It is usually possible to construct a context in which comparisons like statements (6), (7), or (8) can be interpreted. It may be, however, that such a context only permits an interpretation by causing a change in the relative degrees of salience of the attributes of the terms. The point is not that it is impossible to conjure up a suitable context--it almost never is impossible. The point is merely that it is much more difficult to produce such a context for anomalous cases than it is for meaningful ones.

What we have so far, then, is the proposal to replace Tversky's measure of salience of shared attributes with a measure based on the salience of those attributes in B. The contrast in salience levels of attributes in B and A, the diagonality, can then form the basis of a measure of metaphoricity (equation (3)). This account seems to fulfill the need for a measure of similarity that does not predict unrealistically low similarity ratings for similes, as does equation (1). However, salience imbalance is not the whole story.

Attribute inequality in incongruent domains

The notion of matching attributes is obviously essential to the account of similarity that is being proposed. Both similarity itself, and metaphoricity, depend on it. Yet the notion is not without its problems, particularly if one tries to use it in the context of schema-theoretic representations. This section starts with a discussion of these problems and then goes on to examine their effects on metaphoricity.

Consider statement (12):

blood vessels are like aqueducts. (12)

According to the present proposal, the basis of similarity lies in the matching attributes. At first glance it might seem that there is no problem, blood vessels and aqueducts are, at least, both channels through which liquids move. This, however, is a misleading oversimplification.

It is true that aqueducts are channels for carrying liquids, but it is not very convincing to argue that some predicate like "is a channel for carrying liquids" is represented as an important part of a person's knowledge about aqueducts. It seems more natural to suppose that what is represented directly in the schema for an aqueduct is that it is a channel for carrying water. The predicate about liquids is the result of an inference through the one about water. Similarly, blood vessels convey blood; to be sure "being a liquid" is an important attribute of blood, but presumably it does not appear as a subschema in the schema for blood vessels. But this seems to lead to the conclusion that statement (12) is trivial, being based merely on the fact that both blood vessels and aqueducts are channels. The problem is that this conclusion seems plainly wrong.

Suppose, for a moment, that instead of conceiving of attributes as simple predicates, we concentrate on schematic structure, taking into account the relationships between the attributes, not just the attributes themselves. For aqueduct it might be supposed that the schema is something like the following:

AQUEDUCT SCHEMA -- isa (x, AQUEDUCT).

A1: isa (x, channel).

A2: flows-through (water, x)

A3: purpose-of (A1, A2).

etc. (13)

This can be compared with structure (14) which might be used to represent (some of) a person's knowledge about blood vessels.

BLOOD-VESSEL SCHEMA -- isa (x, BLOOD VESSEL).

A1: isa (x, channel).

A2: flows-through (blood, x)

A3: purpose-of (A1, A2).

A4: isa (artery, x).

etc. (14)

If A1, A2, and A3 are viewed as attributes, then the match on A1 represents the fact that both are channels. But, in addition, although the variables in A2 differ (water in the one case, and blood in the other) the structure of A2 is the same in each case, in other words, the attributes, while not identical, are themselves similar. A recursive mechanism for finding matching attributes could thus reveal a second-order match of, for example, "flows-through (liquid, x)". It is also important to notice that A3 is shared, because A3 can be considered to be a kind of "meta-attribute" which incorporates information about interattribute relations, i.e. it incorporates information about the structure of the schemata themselves.

This is one of the reasons why it is helpful to utilize an approach to knowledge representations that incorporates structure, an approach that is richer than a mere listing of simple attributes. It appears to be a good way of capturing the fact that many statements of similarity depend on some structural isomorphism between the knowledge associated with the two concepts, rather than on merely a match of simple attributes. These observations indicate how sensitive attribute matching is to the way in which attributes are represented, how they relate, and what they are, and they may well help to establish the superiority of one kind of representational approach over another.

But we are not yet out of the woods. It can still be objected that the attributes that are purported to match do not really match at all. For example, in what sense are blood vessels and aqueducts really both channels? There are many different kinds of channels, some man-made, and varying greatly in size and material of construction, and some natural, also varying in similar respects, and carrying different kinds of things--liquids, gases, information, etc. It is certainly the case that a blood vessel is a very different kind of channel from an aqueduct. But, if this is so, on what basis can it be claimed that "being a channel" is the <u>same</u> attribute for both? This is the <u>attribute inequality</u> problem. Attributes that may be nominally the same often seem to change their meanings as they are applied to terms in different domains, so that across those domains they are related by similarity rather than by identity.

The solution to the attribute inequality problem lies, at least partially, precisely in this last statement of it. The criterion for a match has to be that the attributes should be highly similar, rather than identical. This, of course, introduces a recursive element into our account of similarity, but there is nothing wrong with that. Returning to example (12), we can now see that attributes A2 from structures (13) and (14), while not identical, are highly similar, consequently they can figure in the set of intersecting attributes. Of course, the reason they are similar is that blood and water themselves share the high-salient attribute of "being a liquid". So, one of the reasons that blood vessels are similar to aqueducts is that they share attributes of attributes.

There remains a difficult problem, however. The existence of higher-order matches is not sufficient to assure similarity. For example, penguins are not normally thought of as being similar to wolves, even though there is a higher-order match--they are both animals. Why is that not sufficient to make them similar? One reason is that it seems to be the only basis for a match, so that the distinctive attributes easily outweigh it.

Another reason, however, might be that there exist constraints on the level of specificity of the categories to which the things being compared are typically thought to belong. Although this proposal is very tentative, suppose it were assumed that in the absence of direct, first-order matches, the existence of some reasonably specific shared domain was a precondition for a sensible similarity statement, i.e. that the existence of such a domain was a necessary but not a sufficient condition for two things to be

perceived as being even potentially similar. One way to interpret the notion of a "reasonably specific shared domain" would be in terms of basic level categories (e.g. Rosch, Mervis, Grey, Johnson & Boyes-Braem, 1976). A level of specificity at or below the basic level would count as being "reasonably specific" whereas a level of specificity more abstract than the basic level would not. Or, one might appeal to a more sophisticated "natural" taxonomy wherein there are more levels from which to select a cut-off point, as is the case, for example, with the taxonomy described by Berlin, Breedlove and Raven (1973).

The consequences of this kind of assumption can now be considered. In an anomalous case, like statement (6) the domains of advertisements and fruits do not come together in any conceivable taxonomic structure in a category at or below the specificity of a basic level category. So, statement (6) fails to satisfy the precondition for a sensible similarity statement. By contrast, it has been supposed that blood vessels and aqueducts come together in a domain of channels or conduits, which does satisfy the precondition. Penguins and wolves only meet in the animal category, which is at a level of specificity more abstract than the basic level, consequently the precondition is again not satisfied. It need not necessarily be possible to find an already encoded category, sometimes a psychologically plausible category has to be "constructed". This, for example, is probably the case for statement (15)

encyclopedias are like gold mines (15)

where a lexical description of the intersecting category might be "place where things are stored", "place where things can be found", or "source of utility". It is also one reason why, under suitable contextual conditions, superficially anomalous comparisons may become interpretable.

Whether or not the general problem of attribute inequality can be solved along these lines, it is a problem that has to be dealt with in any theory of similarity that relies upon attribute matching. The question then arises as to how attribute inequality relates to metaphoricity. Does it, perhaps, enhance salience imbalance? It seems reasonable to suppose that it does. This would mean that less salience imbalance would be needed to give rise to some particular degree of metaphoricity if the matching attributes were not in fact identical. More obvious, however, is the possibility that metaphoricity is increased in this way if the matching attributes are metaphorically similar. This situation is evident in statement (15). When subjects are asked to list attributes of encyclopedias and gold mines they often list "being valuable" as a high salient attribute of both. Clearly, however, the sense of "being valuable" that applies to encyclopedias is one pertaining to intellectual or mental domains, whereas the sense that applies to gold mines is a financial, or pecuniary one (c.f. Schank & Abelson's, 1977 distinction between MTRANS and PTRANS). It might well be argued that the basic ("literal") sense of "valuable" applies in the pecuniary domain and that the application of the attribute in the intellectual domain is derivative or, metaphorical.

To summarize: The domains from which the terms in a statement of comparison are drawn can be quite incongruent, or semantically remote from one another. When this happens there often appear to be no real attribute matches at all. To the extent that there are matches, they tend to depend not on identity of attributes but on similarity between attributes, or configurations of them. This similarity itself often has an element of metaphoricity associated with it as seems to be the case with "is valuable" and is certainly the case with "involves digging around" in statement (15). Thus, if identity is taken as a limiting case of similarity, it seems that the notion of an "attribute match" has to be revised. It has to be based not on attribute identity but on attribute similarity. Then, a match would be defined either in terms of a high similarity between putatively matching elements, or in terms of high metaphoricity between them, as defined in equation (2). It may well be that even where there is attribute inequality, there is still some degree of diagonality, but that perhaps domain incongruence enhances its effects on metaphoricity.

Domain incongruence and attribute inequality turn out to be of general importance in lexical semantics and especially in the analysis of dual function terms. Consider the following, example (16), discussed by Searle (in press):

Sally is (like) a block of ice (16)

One aspect of statement (16) that is rather important, and sometimes overlooked, is that it is ambiguous. If it is used in the context of Sally

coming in from an extremely cold environment, it will have a much lower degree of perceived metaphoricity than if it is used in the context of a disillusioned would-be lover bemoaning Sally's unresponsive frigidity. The reason for this difference is that in the first interpretation there is domain congruence while in the second there is not. Thus, in the first interpretation, whereas being physically cold (e.g. to the touch) is not a high salient, persevering attribute of Sally, it is a high salient attribute of a block of ice, consequently, it satisfies the conditions for being a simile. The attribute "cold" applies to each term in the same domain. The communicative success of such hyperboles depends on the fact that the intensity of the coldness is different vis a vis the two objects, but it does seem to be the same attribute. By contrast, in the second interpretation, the attribute "cold" has to be applied across domains, namely from the physical, temperature, domain appropriate to ice in the one case, to the emotional domain applicable to "psychological" characteristics in the other. This should not be construed as a similarity statement that depends for its success on some kind of pun, for as has already been implied, this characteristic turns out to be quite widespread, often relying on systematic, conventional, underlying analogies between two different domains (in this case, temperature and emotions, and in others, luminosity and personality etc.). In fact, Jackendoff (1975, 1976) argues that the entire semantic system of English can be built up using such notions. He argues, for example, that "give" is basically the same verb as "go" except that the domain of the former is that of "possession" while that of the

latter is that of "location". One can see implicit in this approach the view that nonliteral similarity is a fundamental building block of language in general.

It seems, then, that metaphoricity depends not only on an inequality between relative salience levels in cases where there are genuine attribute matches, but also on domain incongruence in cases where there are not. One might imagine an experiment in which ambiguous comparisons like statement (16) appeared in contexts which forced either the domain congruent, or the domain incongruent interpretation. Subjects asked to rate the degree of metaphoricity and similarity should give higher metaphoricity ratings in the domain incongruent interpretations, but higher similarity ratings in the domain congruent interpretations.

So, returning to example (15), when we say that encyclopedias are like gold mines, a cognitive "gear change" is needed. Gold mines are sources of physical wealth, encyclopedias, of "mental" wealth. The possibility of applying terms like "wealth" in two domains is a result of the fact that there are underlying attributes that are shared by the two applications of the term. The knowledge that the terms are conventionally so applied serves, in comprehension, to "short-circuit" what might otherwise have been a recursive process required to uncover those similarities. However, the domain incongruence serves to increase the semantic distance that the comprehension process has to bridge so that the perceived metaphoricity of a similarity statement that involves fundamentally different domains will be greater.

Metaphoricity and the asymmetry of comparisons

In the present account of metaphoricity in similarity statements a great deal of emphasis is placed upon salience imbalance. In this section the relation of this notion to a number of problems connected with the asymmetry of similarity statements, and changes in judged metaphoricity and similarity will be discussed. In order to do this it will be helpful to review briefly an important component of Tversky's (1977) proposals, namely, the diagnosticity principle. This principle is basically concerned with the fact that context can influence the salience of attributes. Indeed, the influence of context may even extend to introducing an attribute that otherwise would be trivial. Tversky's example is that the attribute "real" has no diagnostic value in the context of actual animals, that is, it would be of very low salience. Yet in the context of animals that included imaginary and mythical beasts it might become very important.

If the proposed modification (equation (2)) to Tversky's model is accepted it follows that a temporary (or for that matter, a permanent) change in the salience levels of matching attributes should result in changes to judged metaphoricity and similarity. For example, many people have the intuition that specifying or linguistically constraining a dimensions of similarity in what would otherwise be a very metaphorical similarity statement, reduces the degree of metaphoricity. Consider statements (17) and (18):

John's face was like a beet (17)

John's face was red like a beet (18)

In statement (18) John's face is compared to a beet with respect to redness. The effect of specifying the dimension is to identify, or foreground the most diagnostic attribute(s). Much the same would be true, although perhaps to a lesser extent, if was like in statement (17) were to be changed to looked like. The result of foregrounding in statement (18) is that all other attributes of both John's face and of beets have less impact on the perceived similarity between the two. Another way of putting this is to say that the salience of the color attributes is increased above the salience of all the other attributes so that the latter no longer play a significant role. The result is a match of high salient to high salient attributes. Accordingly, judged metaphoricity should diminish from statement (17) to statement (18). Furthermore, the prediction that perceived similarity increases follows readily. However, even with respect to an individual attribute such as color or size, the match may not be perfect; John's face was perhaps not literally the color of a beet. This suggests that fine tuning is required, that the attribute of color itself has attributes which may be more or less well matched (intensity, hue, and saturation, for example). Consequently, even when an attribute of comparison has been foregrounded in this way, the similarity of two objects with respect to that attribute can vary. In other words, attribute inequality can be found in literal similarity statements too, which is why it was suggested earlier that some degree of salience imbalance is probably a necessary condition for metaphoricity.

Even though the replacement in statement (18) of a high-B/low-A salience match by a high-B/high-A match as a result of the explicit mention of a shared attribute has been proposed as an explanation of the reduction in perceived metaphoricity, this is not sufficient to guarantee symmetry. There remain strong constraints on the natural order of terms. One reason for this may be that whereas the attribute is matched qualitatively, it is not matched quantitatively. Perhaps statements like example (18) depend for their effectiveness on the intensity of the matching attribute being higher in B than in A. This may relate to Tversky's observation that we normally find the more natural order of terms in a similarity statement to be the one in which a deviant object is referred to in subject position, and the more prototypical one in the object position, as in example (19).

North Korea is like Red China (19)

In the case of statement (18), then, something is needed for the b term that is more prototypically red--it would be unnatural to compare the redness of John's face to something that was typically not very red (e.g. a can of paint). This point becomes more obvious with attributes like cold, where the perception and measurement of intensity is more commonplace.

The proposal, then, is that one reason finding a nominal match, even if it is a high/high one, does not guarantee symmetry, is that a matching attribute may vary with respect to some of its own attributes. Thus, even though "John is strong like an ox" isolates strength as the matching attribute, it is presumably the case that while both may be very strong,

John is really very much less strong than the typical ox. In general, the determination of such within-attribute similarity calls for the same kind of operations as are required for normal similarity judgements, which again leads to the conclusion that the process of similarity perception may have to be viewed as being a recursive one. So long as attributes are considered as subschemata, the idea of attributes themselves having attributes seems to be perfectly acceptable, for it is part of the theory of the representation of knowledge that the current account of similarity presupposes. However, it should be noted that there does seem to be a price to be paid for gaining the flexibility that the embedding characteristic of schemata endows on attributes. It appears to be increasingly difficult to pin down the notion of an attribute.

In considering the question of symmetry it is important not to overlook the fact that the sentence topic itself imposes constraints, so that in the general case a difference between "a is like b" and "b is like a" will always remain because in the first case the sentence topic is a and in the second it is b, that is, there are constraints resulting from such things as the given/new relationship, and the subject/predicate relationship. Tversky refers to this as the focusing effect, noting that normally greater weight is assigned to the attributes of the subject term than to those of the second term (i.e. $\alpha > \beta$). If one considers the intersection term in equation (2) as providing the basis of similarity, the question of symmetry seems to reduce to the fact that a similarity relation will be symmetrical if the basis for the comparison is the same regardless of the order of

mention of the terms in it. Thus, if a is like b in exactly the same respects in which b is like a, then the relation could be symmetrical. It should by now be clear that this condition can never hold for nonliteral similarity statements, because they share high salient B and low salient A attributes. If all the shared attributes in a simile have this high-B/low-A relation, then the simile, if reversed, will result in an anomalous comparison. Furthermore, it follows that with certain kinds of anomalous cases (low-B/high-A), the reversal will result in an interpretable simile, as was the case, for example, with statement (6). Anomalous cases of low-B/low-A, are also reversible in the trivial sense that they are uninterpretable in both directions, and for the same reasons.

The fact that, in general, similarity statements are not purely literal or purely nonliteral also has implications for symmetry. As mentioned earlier, the basis of statement (5) lies in high salient attributes of warts such as being protrusions and being ugly. However, when reversed to give,

warts are like billboards (20)

other attributes seem to take over. Now, the notions of prominence and obviousness seem to be more central. Thus the meaning of statement (5) is different from that of statement (20). In literal comparisons, where the basis of comparison is more likely to remain the same regardless of the order of the two terms, the difference in meaning between the two orders is generally much less dramatic, although residual matches of high to low may still have an effect. This almost certainly relates to Tversky's interesting

observation that "the variant is more similar to the prototype than the prototype is to the variant (p.333)", as evidenced by comparing statement (19) with its reversal. In cases where the literal similarity is very high, that is, in cases where (most) people perceive the matches as being at similar levels of salience, the maintenance of symmetry is easier, as for example, in statements (21) and (22).

Czechoslovakia is like Hungary (21)

Hungary is like Czechoslovakia (22)

The general conclusion, then, is that the degree of symmetry is inversely related to the degree of metaphoricity, so that the more metaphorical the comparison, the less symmetrical it is likely to be. Notwithstanding this, it remains true that other factors also cause asymmetry. For example, there may be subtle meaning changes resulting from high-B/low-A matches becoming low-B/high-A matches and vice versa. Second, the kind of variables mentioned earlier, but ignored in our discussion--the subject/predicate relation, the given/new relation, relative amounts of knowledge associated with the terms, and the typicality of the terms--these variables will almost always have a residual effect, an effect that can to a large extent be handled by accepting Tversky's account wherein, usually, $\alpha > \beta$, thereby giving less weight to the distinctive features of the second term. Finally, metaphoricity can be reduced when linguistic devices are used to foreground certain attributes of classes of them at the expense of others. This is why specifying a dimension with respect to which two

otherwise substantially dissimilar objects are to be compared seem to reduce the metaphoricity. This is also why verbs of similitude more specific than *to be like*, that is, verbs such as *to look like*, *to sound like*, *etc.*, generally give rise to more literal similarity statements.

Two types of similarity statement

The account of literal and nonliteral similarity statements that has been proposed locates the basis of comparison of two putatively similar terms in the intersection term of equation (2). In the case of metaphorical similarity statements this "basis of comparison" is usually called the *ground* (of the metaphor). This situation implies that from the point of view of someone attempting to *understand* a similarity statement, success can only be achieved if the intersection term is not empty. From this perspective comprehension will be quite straightforward if the matching attributes are already part of the schemata for both the *a* term and the *b* term. But this need not always be the case. It sometimes happens that people have to make inferences about what a particular statement means, that is, they sometimes have to introduce new attributes into their representation for the *a* term. This section focuses on the differences between such *attribute introducing statements*, and the more straightforward cases in which it will be supposed that the preexisting matching attributes have their salience levels in the *a* term *promoted*.

Suppose that someone utters statement (16) with the intention of imputing sexual inertness to our already much maligned Sally. The distinction of concern is reflected in the kinds of reply the hearer might

make: "Yes, I know she is. It's a shame isn't it?", as against "Oh really? I didn't know that. I would never have thought it."

So, when we say " a is like b" we may be inviting the hearer not to find a match of attributes, but to take some salient attributes of b that were not previously part of the hearer's schema for a and to build them into the schema for a.

It should be noted at the outset that, strictly speaking, the difference between attribute promoting and attribute introducing similarity statements is not a difference that pertains to the similarity statement per se, but rather a difference that has to do with the use of a statement by a particular person, to a particular person, on a particular occasion. Nevertheless, the distinction gives rise to the question of what comprehension mechanism can account for the fact that people can understand similarity statements when there can be no match, given that the determination of matches plays such a central role in the present proposals.

The answer that will be proposed here is that the mechanism is one of attempted predication. This would mean that the comprehension process might be something like this: With preference being given to the most salient subschemata associated with the b term, an attempt would be made to apply them to the schema for the a term. Now, one way to determine whether some particular attribute can be applied to something is to determine whether or not it is already included in the representation of that thing. Thus, matching, or at least, testing for a match, might well be the first step in the process. However, matching cannot possibly always be the only step

because if the test for a match fails, it is not possible to conclude that the attribute in question cannot be applied, but only that it is not already present. The simplest prospect if the match test fails would be to determine whether any gross conceptual incompatibility would result by applying the attribute in question to the concept. This incompatibility would have to be unresolvable. Thus, for example, the attribute "being white" cannot be applied to the concept sermons as part of the process of trying to apply high salient attributes of sleeping pills to the concept sermons, because to do so would result in an unresolvable incompatibility. White things are physical objects, sermons, while often sufficiently boring to induce sleep, are not physical objects.

The results of comprehension vis à vis changes in the nature of the schema for the a term enable us to characterize the difference between the two types of similarity statement. In the case of attribute-promoting statements, subschemata corresponding to the matching attributes already exist in the schema for a and all that happens is that their salience levels are increased. In the case of attribute-introducing statements either the existing value of a variable is changed, or a value is provided where previously there was only a variable. Furthermore, in both kinds of statements it could be assumed that the attention to a particular variable (or set of them) that is occasioned by the use of the statement gives rise to (at least a temporary) increase in the salience level of that variable (or set of them) for the a term. This kind of account permits the comprehension of both kinds of similarity statement, be they literal or

nonliteral, to be absorbed into the general framework of comprehension that is suggested by schema theory. It has the added advantage that it suggests that from the point of view of comprehension, there may not be much difference between the comprehension of similes and their corresponding metaphors: both proceed by attempted predication. In addition, it is consistent with the view that nonliteral similarity statements do not require a different comprehension mechanism from literal ones (Ortony, Schallert, Reynolds & Antos, 1978).

What happens if no high salient attributes from B seem to apply to the a term? How can one account for the apparent fact that one can usually dream up a context in which even the most anomalous statements can make sense? One answer to this question, already hinted at, is that a speaker (or hearer, or reader or writer) may reorder the salience of the attributes of (especially) the second term in the comparison. Such reordering is clearly involved when the kind of foregrounding described with respect to statement (18) occurs. Foregrounding, it may be recalled, promotes the salience of some attribute or group of attributes, often with the result of reducing the degree of metaphoricity. Thus statement (4) can be made interpretable by presupposing a context in which being a physical object is very important. So a context in which it makes sense to utter statement (23) will also be able to support an interpretation of statement (4).

billboards are like pears	(4)
in so far as they are both physical objects, billboards are like pears.	(23)

However, even though statements (4) and (23) are perfectly interpretable in a context which permits the reordering of attributes, notice that without such an assumption they are somewhat odd.

The basic proposal, then, is that similarity statements are processed by attempted predication. It may be, however, that if the process fails to find a match of high salient attributes, or, more specifically, if it fails to find a literal interpretation, that the matches that are subsequently found come to be perceived as being more important than they otherwise would. For example, the simile (24) seems to have a higher degree of subjective similarity (if understood) than would be predicted by equation (1), even allowing for the proposed modifications (equation (2)).

Cigarettes are like time bombs. (24)

Furthermore, it appears to be the case that similes are rather like jokes in the sense that if an initial failure to properly comprehend is later followed by a full understanding, the anomalous components lose their force.

In a pilot study designed to investigate this question, subjects rated the similarity of the terms in similes as being consistently higher when encouraged to perceive their metaphorical nature than under conditions which encouraged literal interpretations. Lower ratings in the literal condition were found for 14 out of 15 items. All this suggests that people may reduce, perhaps to zero, the weights accorded to distinctive attributes (α and β) on discovering that they are working with a nonliteral comparison.

The central point of this section has been to offer an explanation of how people can understand comparisons when they have insufficient

information about the subject term to enable them to find matching attributes. It was suggested that a mechanism of attempted predication of attributes of the b term to the a term could handle this problem. Then, testing for a match would be one way to determine the applicability of an attribute. Some effects of context on salience levels were also discussed, particularly those which, by permitting reordering of salience levels, enabled a comprehensible interpretation to be imposed on a superficially anomalous similarity statement.

Metaphor

The present proposals have a number of implications for a theory of metaphor--implications which seem to raise serious problems for some quite widespread assumptions, while throwing light on others.

The idea that metaphors are really just covert comparisons, or analogies has dominated philosophical approaches to the problem for centuries, and it has begun to take hold in cognitive psychology and psycholinguistics. This view, which is the standard Aristotelian one, has recently been proposed as the basis for a psychological treatment of metaphor comprehension by, for example, Kintsch (1974) and Miller (in press). In many ways it is an appealing notion because it not only offers the prospect of accounting for a difficult-to-understand concept like metaphor in terms of an easier-to-understand concept like comparison, but it also recognizes that comparisons do underlie metaphors, even though this may not be apparent from surface structural features. The present proposals, however, are incompatible with this view if it is taken to be a philosophical or psychological explanation.

According to the account that we have developed, metaphoricity is a characteristic of similarity statements. So, the similarities that are covert in metaphors are themselves metaphorical in nature. It follows from this that nothing can be explained about metaphoricity itself by (correctly) identifying a metaphor's relationship to its corresponding simile (if it has one). If the metaphor, statement (25),

encyclopedias are gold mines (25)

is a meaningful statement by virtue of the fact that encyclopedias are like gold mines, that does not explain what it is about statement (25) that makes it a metaphor, since encyclopedias are not really like gold mines at all, they are only metaphorically like them. So, while it is perfectly true that there may be little difference between a metaphor and its corresponding simile (indeed, if the comprehension mechanism is one of selective attribute predication,[2] it could be the same for both), any problems about the nature of metaphors and the comprehension mechanisms for them remain unsolved.

The mistake in the view here being criticized is to suppose that similes are "literal" comparisons. This supposition is implicit in the view of Kintsch (1974) that (necessarily semantically anomalous) metaphors are reinterpreted as semantically acceptable (explicit) comparisons, and in the view of Miller (in press) that the (only) difference between a simile (to which a metaphor can be reduced) and a literal comparison is that in the latter the basis of the comparison is "obvious". It is quite explicit in Searle (in press) who refers to similes as "literal similes".

The view that the comparisons underlying metaphors are unproblematic literal comparisons can be shown to have problems quite independently of the current proposals. There is linguistic evidence--evidence from the use of certain kinds of "hedges" (see, Lakoff, 1972). Consider the hedges "metaphorically speaking" and "really". If two things are really similar, it should seem odd to say that they are metaphorically similar, and, conversely, if they are metaphorically similar, it should seem odd to say that they are really similar. Statements (26) and (27) support these predictions:

metaphorically speaking, education is like a stairway (26)

education is really like a stairway. (27)

Whereas statement (26) makes perfectly good sense (some people might even think that it is true), statement (27) is simply false. If something is genuinely metaphorically like something else, it cannot be really (truly, literally) like it. And, the converse is that if two things are really (truly, literally) similar, it makes no sense to say that they are metaphorically similar. So, while statement (28) seems quite reasonable, statement (29) does not.

stairways are really like escalators (28)

metaphorically speaking, stairways are like escalators (29)

Similarly, one would expect that the negation of a metaphorical similarity statement would be (literally) true, while the negation of a literal one would be false, as in statements (30) and (31):

science is not (really) like a glacier (30)

an icefall is not (really) like a glacier (31)

Linguistic data like these support the idea that the locus of metaphoricity lies not in the surface structure of a statement (e.g. the presence or absence of "like") but in the underlying comparison itself. The standard view of metaphor as covert comparison has no way of accounting for these observations, whereas the proposals for nonliteral similarity that have been presented actually predict them.

If the inadequacy of the standard view is accepted, it follows that a second widespread assumption about the nature of metaphors suffers from the same problem. This is the view that metaphors are based on, or are covert analogies. Again, the problem is not that this observation might be false. The problem is that even if true, the claim has little or no explanatory value. Analogies are statements of similarity--similarity between relations between "objects", rather than between objects themselves, but none the poorer for that. If metaphoricity is a characteristic of similarity statements, one would expect analogies to vary in their degree of metaphoricity in just the same way as similarity statements do. Consider, for example, statements (32) and (33):

lambs are to sheep as kittens are to cats (32)

putting William Miller in charge of the Federal Reserve Board would be like puttin Rudolph Nureyev in the ring against Leon Spinks for the heavyweight title of the world. (33)

Both are analogies, but statement (32) is "really" true whereas statement (33) (William Proxmire's remark at the Senate Confirmation Hearings[3]) is not.

Thus, it could be argued that statement (33) is a metaphorical analogy because there are no high salient attributes (i.e. relations) of the second term that are equally high salient attributes of the first (viewing the terms as the relationships between the constituents). But, statement (32) is a literal analogy because there are high salient attributes of both complex concepts that are shared. The attributes of such complex schemata are the set of relations that in their entirety make up the schema. An important difference between statements of (analogical) similarity and the kind of similarity statements that have been discussed so far, is that in analogies the complex schemata that are constituted by the two pairs of terms usually have to be constructed at the time of comprehension, rather than retrieved from memory. This means that one would expect metaphors based on underlying analogies (often called "proportional" metaphors) to be more difficult to understand. There is some evidence that this is true developmentally (Billow, 1975).

Metaphorical analogies are not at all uncommon in ordinary discourse. For example, the following one is taken from a story about the "alias program" for reinstating 'safe' lives for informers, reported in Newsweek (November, 31th 1977). The story, entitled "Your cover is showing" opens with the following analogy:

Informers are to criminal justice what uranium is to a nuclear reactor - (34)

Left unexplained, statement (34) is somewhat obscure, perhaps because in constructing a complex concept for the second term ("what uranium is to a nuclear reactor") all kinds of relationships can be introduced, uranium is the fuel, it is one of the more dangerous aspects of a reactor, etc. Yet, none of these high salient relations are obvious, high salient relations of the first term (what "informers are to criminal justice"). A literal analogy would have a match of high to high salient relations, and this one does not. Thus, one is willing to deny that it is true, literally, just as one is willing to deny that nonliteral statements of similarity in general are true. And, just as with similarity statements in general, the explicit statement of the basis of the comparison that follows, serves to reduce the perceived metaphoricity by enhancing the salience of a particular attribute. The second part is essential if the entire sentence is to be understood: "Informers are to criminal justice what uranium is to a nuclear reactor - they make the system go, but they're an awful lot of trouble to dispose of afterward."

Interesting things happen to analogies when their terms are omitted. For example, one can convert statement (34) into statement (35), which makes it even more obscure because the missing term has to be supplied, yet it depends on the to-be-established relation.

Informers are the uranium of criminal justice (35)

It is interesting to note, in this example, that the most natural interpretation is far removed from that for statement (34). Now it seems that "uranium" is functioning to highlight attributes related to value, so that the most natural interpretation is that informers are very valuable to criminal justice. One thing that this confirms is the claim made earlier, namely, that attributes, since they can be complex, can often be equivalent to relations, even though they may look like simple predicates. However, to express relations in non-relational ways can, as in this case, be very misleading. Since no sharp distinction is being made between statements of similarity that are, and those that are not fundamentally analogical in character, this matters little. But it is not very encouraging for those (e.g. Miller, in press) who would argue for a conversion process of metaphors to similes and analogies as the essence of the underlying comprehension mechanism. Thus, the old Aristotelian notion that metaphors are based on the principles of analogy is not very helpful. Neglecting for the moment the distinction between metaphors and similes, it has to be concluded that metaphors, like analogies, are based on the principles of similarity.

Even if it is true that there is no fundamental difference between a regular statement of similarity and an analogy, it does not mean that a theory of similarity judgments is <u>ipso facto</u> a theory of the problem solving that goes into the solution of analogy problems. The present proposals have nothing whatsoever to say about the manner in which the complex concepts are constructed. In standard analogy problems, part of the problem is to

construct a schema that involves one of the pairs of concepts in some central way in such a manner that the relation between them can be applied to the other side of the "equation". The approach to similarity being advocated here is neither capable of, nor intended to deal with the way in which analogy problems are solved.

It is now possible to explicate the relationship between metaphors on the one hand, and similes and analogies on the other. Essentially a metaphor is a nonliteral comparison, either between objects or between relations between objects. In the former case it is related to a nonliteral similarity statement that is normally called a simile, and in the latter case it is related to a nonliteral similarity statement that is normally called an analogy. In both cases, the difference between the metaphor and its corresponding similarity statement is not that the one is metaphorical and the other literal, the difference is that the one is an indirect statement while the other is a direct one. The fundamental mistake in the standard view is that it confuses metaphoricity with indirection.

Finding the comparison view of metaphor unsatisfactory, there have been those (most notably, Black, 1962, and, in press) who have proposed an alternative account of metaphor known as the interaction theory. The idea behind this view is that the two terms in a metaphor somehow "interact" to produce some new "emergent" meaning. The view has been criticized on the grounds that the notion of interaction is too vague and too metaphorical itself (e.g. Black, in press; Searle, in press). Although equally vague about how to characterize "interaction", Verbrugge and McCarrell (1977)

found evidence leading them to conclude that it is not sufficient to assume that "the topic is passively schematized by salient properties of a vehicle domain: The topic and the vehicle terms interact in specifying the ground. (p. 529)" According to the present proposals, the ground of a metaphor will be the shared attributes of the underlying nonliteral similarity statement, and, in particular, those attributes that are of high salience for the vehicle but of low salience for the topic. Consequently, it would seem that a notion of interaction could be captured by the fact that the attributes comprising the ground will depend on both the topic and the vehicle. The topic and vehicle interact in the sense that the topic term imposes constraints on the attributes of the vehicle term that can be applied and that are of high salience for the former but of low salience for the latter.

If the account of nonliteral similarity that has been presented is correct, it has some particularly important consequences developmentally. It is common knowledge that children appear to produce metaphors long before there is evidence that they can understand them, a state of affairs which, if true, would be completely contrary to what is generally believed about language acquisition, namely, that comprehension precedes production. The point was well put by Winner, Rosenstiel, and Gardner (1976) who started their paper with the following paragraph:

> There is an apparent paradox concerning the development of metaphoric sensitivity in children. It has been argued, on the one hand, that the capacity to understand metaphoric figures of speech develops only during late childhood and early adolescence (Asch & Nerlove, 1960;

> Elkind, 1969; Schaffer, 1930). This contention is consistent with the view that metalinguistic skills (the ability to perform operations on language itself) develop only in the final stages of language acquisition (Inhelder & Piaget, 1958; Jakobson, 1960). On the other hand, studies focusing on the child's ability to produce figurative language have repeatedly documented the spontaneous use of metaphors, similes, and other figures of speech by preschool-age children (Carlson & Anisfeld, 1969; Chukovsky, 1968; Gardner, 1973; Gardner, Kircher, Winner, & Perkins, 1975; Weir, 1962). In addition, preschoolers have been shown to be able to match words to elements from other sensory modalities in a metaphor-type paradigm (Gardner, 1974). (p. 289)

Winner et al. attempted to resolve the paradox by distinguishing between various levels of metaphoric comprehension, attempting to show that in fact very young children do have some rudimentary forms of metaphoric comprehension after all.

If the present proposals are accepted, however, there is an alternative way of resolving the paradox--one that is perhaps more appealing. It could be argued that preschool-age children who are apparently producing metaphors are, in reality, producing statements based on underlying literal similarities <u>from their perspectives</u>. For example, Chamberlain and Chamberlain (1904) cited the case of a child who used the word "moon" to refer to cakes (among other things). Now, it would of course be possible to argue that since cakes are not really moons the child was speaking metaphorically, but that hardly seems reasonable. A more reasonable

approach would be to deny that the child was speaking metaphorically, denying that very young children had the metalinguistic awareness needed. One would then go on to argue that from the child's perspective, the moon and cakes shared a high salient attribute, namely that of being (roughly) circular in shape. This would mean that moons and cakes were literally similar given the state of the child's schemata at the time. Later, as those schemata developed into ones more closely approximating an adult's the matching attribute would be high-salient for the b term and low-salient for the a term, thus satisfying the criterion for nonliteral similarity. Consequently, from the adult's perspective productions of children may appear metaphorical, or at least, nonliteral, because the adult has substantially differently structured schemata and (presumably) more highly differentiated salience information for their components. The child, on the other hand, just perceives the two things in question as really being similar. The resolution of the paradox would thus depend on the recognition that the knowledge representations of adults and children are often very different.

Finally, one might ask how the present proposals relate to the goodness of metaphors. There has been all too little research into this question, although some is beginning to emerge. Recent research by Sternberg and his colleagues (Sternberg, Tourangeau and Nigro, in press; Tourangeau and Sternberg, Note 1, Note 2) is based on a geometric approach. Their research assumes a representation in which the topic and the vehicle of the metaphor (the first and second term, respectively) are viewed as belonging to

different subspaces within a more global hyperspace. When the two terms are juxtaposed in a metaphor one can think of superimposing their corresponding local spaces, coordinating the dimensions. Then, the goodness of a metaphor can be characterized in terms of the within-subspace distance and the between-subspace distance. If the local subspaces from which the two terms are drawn are remote but the superimposed within-subspace distance is small, then we have a good metaphor. They also hypothesized that the aptness and the comprehensibility of a metaphor goes down if the between-subspace distance gets exceedingly large. In many respects the account offered by Sternberg and his colleagues is compatible with the views that have been presented here.

The present proposals are that metaphoricity requires high-salient attributes of the vehicle to be (applicable as) low-salient attributes of the topic while there exist high-salient attributes of the vehicle that cannot be applied to the topic at all. This latter constraint can be interpreted as requiring the domains (local subspaces) from which the terms are drawn, to be different. Although their theory does not demand salience imbalance as a condition for metaphoricity, Tourangeau and Sternberg (Note 2) found empirical evidence that vehicles (but not topics) that were extreme on relevant dimensions within their domains tended to produce more comprehensible metaphors. They attribute this finding to the possibility that "... the extreme values in the vehicle help us find its relevant characteristics by making them more salient...(p.37)" Since the high correlation between extremity and comprehensibility was not found with

topics of metaphors, their results can be interpreted as evidence of high-B/low-A matches in similarity statements that were understood as metaphors.

The present proposals have not addressed the question of the quality or aptness of metaphors, however, it seems reasonable to suppose that quality will be primarily dependent on metaphoricity. If both metaphoricity and similarity are low, the similarity statement will appear to be anomalous and will be correspondingly difficult to comprehend. Apart from this, no special relationship between goodness and comprehensibility is predicted. This account in fact gains some support from Tourangeau and Sternberg (Note 2) who failed to find their predicted negative relationship between comprehensibility and between-subspace distance, but who did find a positive relationship between comprehensibility and aptness.

The question of the goodness of metaphors is a much more complex one than might be supposed at first glance. Kintsch (1974), for example, points out that the phrase "bachelor girl" seems much better than the phrase "spinster boy", assuming that both are intended to be metaphorical expressions. If these expressions are cast into similes ("Some girl (or other) is like a bachelor", and "Some boy (or other) is like a spinster") it would be necessary to show how the degree of metaphoricity of the former was higher than that of the latter. The only hope would be to find that the relative difference between the levels of salience of shared attributes was higher in the one case than in the other, and/or that a number of attributes (perhaps emotive ones) were present in the schema for one of the concepts (e.g. spinster), that were not present in the schema for the other. Thus,

for example, attributes such as "being straight-laced" and perhaps that of being "prudish" might be of high salience for spinster (and consequently "being unmarried" might be relatively lower) whereas these attributes might not exist in the schema for bachelor at all (and probably do not). Whether or not this is the correct account for these examples, it is clear that the explanation could be along these lines.

Conclusion

For two thousand years scholars have believed that similarity and analogy are heavily implicated in metaphors, yet there has been no satisfactory statement of the exact relation between these concepts. This paper has proposed an account of similarity that offers the prospect of determining just how similarity, analogy, and metaphoricity relate to one another.

It has been argued that the essence of metaphoricity is salience imbalance. This imbalance can be enhanced by attribute inequality. An account of similarity incorporating this notion was proposed and its implications for the asymmetry of similarity statements were explored. The proposals predict that nonliteral similarity statements will tend to be much less reversible than literal similarity statements, and that in cases where reversals still result in meaningful comparisons that the meaning change will be greater for similes than for literals. The account also predicts that the terms in similes will be perceived as being more similar than theories based on literal similarity alone would predict. Whereas the full consequences of the proposals for theoretical and empirical research on

metaphors will have to await further work, a number of suggestions in this direction were made.

In conclusion, it should be reiterated that metaphoricity is a characteristic of similarity statements (and judgments). This observation alone could have important consequences for the way in which similarity is conceptualized and for the kind of empirical research that is undertaken in the area of metaphor. Surely, we cannot hope to properly understand the huge contribution that the perception of similarity makes to cognition if we fail to recognize that people are not restricted to judging, perceiving, and talking about literal similarity. Much of cognition depends on the recognition of metaphorical relations; it depends on going beyond literal similarity.

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[1]There have, however, been proposals to avoid these difficulties, most recently by Krumhansl (1978).

[2]It is possible that there are cases in which, or occasions on which, attributes of the b term are predicated, not by selecting applicable high salient ones, but by rejecting inapplicable ones and applying the rest. Such application by attribute rejection rather than by attribute selection might result in richer representations in the modified topic schema.

[3]It is interesting to note the radical ambiguity of Proxmire's assertion. It could either be interpreted in terms of the high salience of Nureyev's potential nimbleness and elusiveness, or, antithetically, in terms

of the high salience of Spinks's hugely superior strength and power. It takes only a little imagination to decide which of these alternatives Proxmire had in mind.